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(71)出願人 000001993

株式会社島津製作所

京都府京都市中京区西ノ京桑原町1番地

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(72)発明者 麻生 喜昭

京都府京都市中京区西ノ京桑原町1番地

株式会社島津製作所内

(74)代理人 100085464

弁理士 野口 繁雄

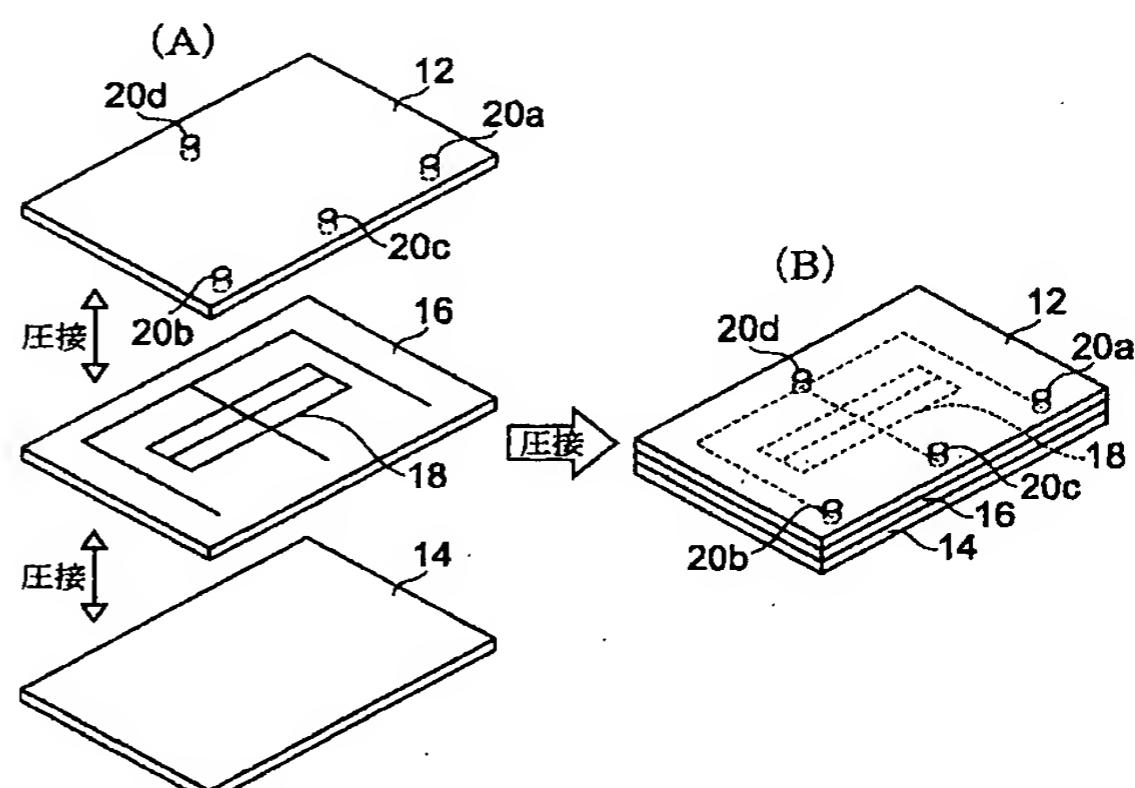
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(54)【発明の名称】液体クロマトグラフとその溶離液混合装置

(57)【要約】

【課題】 内容量を小さくすることができ、所望の混合流路を形成するのも容易で、組立ても容易な混合装置を提供する。

【解決手段】 上下の金属耐食性板12, 14間に流路18を形成した金属薄板16が挟み込まれ、接合されて一体化された混合装置が構成されている。薄板16は厚さが2mm以下のステンレスからなる耐食性のある金属板であり、耐食性板12, 14も同じ材質の金属板である。流路18に対応して、上側耐食性板12には4つの貫通穴20a～20dが開けられている。4つの穴20a～20dのうちの2つを溶離液供給口として、他の2つのいずれかを選択して混合された溶離液取出し口とする。



【特許請求の範囲】

【請求項1】 液体クロマトグラフのグラジエント溶出装置で使用される溶離液の混合装置において、少なくとも2枚の耐食性板が内部に流路を形成するよう接合されて接合体が構成されており、その接合体の外面には、前記流路の異なる位置に設けられてそれぞれの溶離液を供給する少なくとも2つの液供給口と、前記流路のさらに異なる位置に設けられて混合された溶離液を取り出す取出し口とを備えていることを特徴とする混合装置。

【請求項2】 前記接合体は2枚の耐食性板からなり、前記流路は前記接合体の接合面に形成され、前記液供給口と前記取出し口は前記耐食性板の一方に又は両方に分かれて設けられている請求項1に記載の混合装置。

【請求項3】 前記接合体は上下2枚の耐食性板間に少なくとも1枚の耐食性薄板が挟み込まれて接合されており、前記流路は内部に挟み込まれた前記薄板により形成され、前記液供給口と前記取出し口は前記耐食性板の一方に又は両方に分かれて設けられている請求項1に記載の混合装置。

【請求項4】 前記薄板の流路は1枚の薄板内で分岐をもってつながった1つの流路である請求項3に記載の混合装置。

【請求項5】 前記薄板の流路は2枚以上の薄板に形成された流路からなり、そのうちの1枚の薄板には互いに独立したそれぞれの溶離液用の流路が形成されており、他の薄板には前記1枚の薄板の全ての流路につながる混合用流路が形成されている請求項3に記載の混合装置。

【請求項6】 請求項1から5のいずれかに記載の混合装置を備えた液体クロマトグラフ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は高速液体クロマトグラフなどの液体クロマトグラフと、そこで用いられるグラジエント分析用の溶離液混合装置（ミキサー）に関するものである。

【0002】

【従来の技術】液体クロマトグラフのグラジエント分析では、2種類又はそれ以上の溶離液を混合してカラムに導くために、そのグラジエント溶出装置には複数の液を混合する混合装置が備えられている。混合装置としては、可動部を持たないフロースルー方式のものが多く用いられており、例えば内径が3mm程度、長さが50mm程度のパイプ中にステンレススチールなどのボールを充填したものがある。このような混合装置は、その入口、出口の機械加工品など、複数の機械加工品で構成されている。

【0003】

【発明が解決しようとする課題】そのような混合装置は、内部に液混合用のボールを充填しているため、内部

容量が大きくなる。混合のための流路は内部に充填したボールにより決定され、所望の流路を形成することはできない。また加工や組立てが複雑になり、コスト高になる。

【0004】本発明の第1の目的は、これらの問題を解決して、内容量を小さくすることができ、所望の混合流路を形成するのも容易で、組立ても容易な混合装置を提供することである。本発明の第2の目的は、そのような混合装置を備えた液体クロマトグラフを提供することである。

【0005】

【課題を解決するための手段】本発明の混合装置は、少なくとも2枚の耐食性板が内部に流路を形成するよう接合されて接合体が構成されており、その接合体の外面には、前記流路の異なる位置に設けられてそれぞれの溶離液を供給する少なくとも2つの液供給口と、前記流路のさらに異なる位置に設けられて混合された溶離液を取り出す取出し口とを備えていることを特徴とする。本発明の液体クロマトグラフは、上記の混合装置を備えたものである。

【0006】

【発明の実施の形態】少なくとも2枚の耐食性板からなる接合体の一形態は2枚の耐食性板からなるものであり、流路はその接合体の接合面に形成され、液供給口と前記取出し口は耐食性板の一方に又は両方に分かれて設けられているものである。

【0007】接合体の他の形態は上下2枚の耐食性板間に少なくとも1枚の耐食性薄板が挟み込まれて接合されたものであり、流路は内部に挟み込まれた薄板により形成され、液供給口と前記取出し口は前記耐食性板の一方に又は両方に分かれて設けられているものである。

【0008】その場合、薄板の流路は1枚の薄板内で分岐をもってつながった1つの流路とすることもできるし、又は2枚以上の薄板に形成された流路からなり、そのうちの1枚の薄板には互いに独立したそれぞれの溶離液用の流路が形成されており、他の薄板にはその1枚の薄板の全ての流路につながる混合用流路が形成されているようにすることもできる。

【0009】図1はグラジエント分析用の液体クロマトグラフの一例を示したものである。グラジエント溶出装置2は2種類の溶離液AとBを所定のプログラムに従って混合してカラムで供給するものである。グラジエント溶出装置2には高圧グラジエント方式と低圧グラジエント方式があるが、いずれの方式であってもよい。グラジエント溶出装置2内は2種類の溶離液を混合するために本発明の混合装置4が備えられている。6は試料を分離するカラムであり、カラム6に至る溶離液流路には試料導入部8が設けられている。10はカラム6の溶出液から試料成分を検出する検出器である。検出器10を経た溶出液はドレインへ排出される。本発明は3種類以上の

溶離液を混合する場合にも同様に適用することができます。

【0010】図2は本発明の混合装置の一実施例を示したものであり、(A)はその分解斜視図、(B)はその組み立てた状態の斜視図である。上下の金属耐食性板12, 14間に流路を形成した金属薄板16が挟み込まれ、これらの3枚の金属板を圧接して接合することにより、(B)に示されるように一体化された混合装置が構成されている。薄板16は厚さが2mm以下のステンレス(例えばSUS316など)からなる耐食性のある金属板であり、耐食性板12, 14も同じ材質の金属板である。

【0011】薄板16には流路18がエッチング加工やプレス加工により形成されている。流路18は、図2に示されたような閉ループをもつものの場合は底をもつ溝として形成されるが、流路の形状によっては貫通した溝として形成することもできる。

【0012】流路18は分岐部や閉ループをもつ1つにつながった流路であり、その流路18に対応して、上側耐食性板12には4つの貫通穴20a～20dが開けられている。下側耐食性板14は溝や穴をもたない平坦な金属板である。

【0013】これらの3枚の金属板12, 14, 16を例えばHIP処理などの接合方式により、接合すると、(B)のように上側耐食性板12上に出入り口を持つ流路が形成される。接合方法のHIP(hot isostatic pressing: 熱間等静圧圧縮成形)処理は、金属板を重ねて1000kg程度で加圧することにより接合する方法である。HIP処理による接合は強固な密着を達成することができ、液漏れなどの不具合が発生しにくい利点がある。しかし、他の方法により接合してもよい。

【0014】図2の実施例では、4つの穴20a～20dのうちの3つを溶離液供給口として、残りの1つの穴を溶離液取出し口とすれば、3種類の溶離液の混合装置となる。また、4つの穴20a～20dのうちの2つを溶離液供給口として、他の2つのいずれかを選択して混合された溶離液取出し口とすることもできる。選択されなかった穴は閉じておく。溶離液供給口と溶離液取出し口の選択により、溶離液の混合比率を選択することができる。

【0015】図2の実施例において、流路が底をもつ溝として形成されている場合は、下側耐食性板14を省略し、上側耐食性板12と流路を形成した金属薄板16との接合体として混合装置を構成することができる。この場合、機械的強度を高める上で金属薄板16の厚みを厚くするのが好ましい。

【0016】図3は図2の実施例の混合装置に、溶離液の供給と取出しを容易にするためにジョイント部22a～22cを設けたものである。この例では上側耐食性板12の3つの穴にそれぞれジョイント部22a～22c

が固定され、他の1つの穴20dは閉じられている。それらのジョイント部22a～22cのうちの2つを溶離液供給口とし、他の1つを混合溶離液取出し口として使用する。

【0017】図4に他の実施例を示す。この実施例では、薄板に混合流路を形成するために、3枚の薄板が設けられ、その3枚が上下の耐食性板32と34の間に挟まれて接合され、一体化されている。

【0018】薄板36には互いに独立した2つの流路42aと42bがエッチングやプレス加工により形成されている。この溝42aと42bの形状であれば、溝は底を持つものであっても貫通したものであってもよい。それぞれの溝42aと42bはそれぞれ歯状に分岐しており、分岐した溝の先端部が交互に配置されている。

【0019】薄板36上に重ねられる薄板38には、溝42aと42bの所定の位置に対応するように、一列に配列された貫通穴44が形成され、溝42a, 42bの他の位置に対応してそれぞれ液供給口となる貫通穴46aと46bが形成されている。

【0020】更に、薄板38上に配置される薄板40には、貫通穴44を1つの穴にまとめるための貫通した長穴50と、穴46a, 46bと対応した位置にそれぞれ貫通穴48aと48bが形成されている。

【0021】上側耐食性板32には薄板40の貫通穴48aと48bに対応した位置に液供給口となる貫通穴52aと52bが形成され、長穴50の所定の位置に液取出し口となる貫通穴52cが形成されている。

【0022】内部に挟み込まれる3枚の薄板36, 38, 40は厚さ2mm以下のステンレススチール板のような耐食性のある金属板であり、耐食性板32, 34も同じ材質の金属板である。これらの5枚の金属板32, 34, 36, 38, 40がHIP処理などの方法により接合されて一体化されたものとなる。穴20a, 20b及び20cには図3のようなジョイント部を固定するのが好ましい。

【0023】図4の実施例では穴20aと20bからそれぞれ供給された溶離液が薄板36の分岐した流路42aと42bによりそれぞれ分流し、薄板38の貫通穴44を経て薄板40の長穴50へ導かれる。長穴50では流路42a, 42bの分岐に従って溶離液が交互に導かれ、取出し口20cから取り出される溶離液は2つの溶離液が混合されたものとなる。

【0024】上下の耐食性板間に挟み込まれる薄板の枚数は特に限定されるものではなく、形成する混合流路に応じて適宜設定することができる。流路の形状は、実施例に示されたものは単なる例示に過ぎず、所望の混合状態を得るために適宜設計することができる。

【0025】

【発明の効果】本発明では、混合流路は耐食性板に形成された流路により構成するため、所望の形状に形成する

ことも複雑な流路を形成することが容易であり、所望の混合比率などの混合状態を調節できるようになる。また、細い溝により流路を形成すれば混合装置内の容量を小さくすることができ、少量の溶離液を供給する分析に好都合となる。小型の混合装置とすることもできる。また、耐食性板接合して一体化するだけであるので、加工や組立てが容易であり、部品点数も少なくてすむ。

【図面の簡単な説明】

【図1】本発明のグラジエント分析用の液体クロマトグラフの一例を示す概略流路図である。

【図2】本発明の混合装置の一実施例を示したものであり、(A)はその分解斜視図、(B)はその組立てた状態の斜視図である。

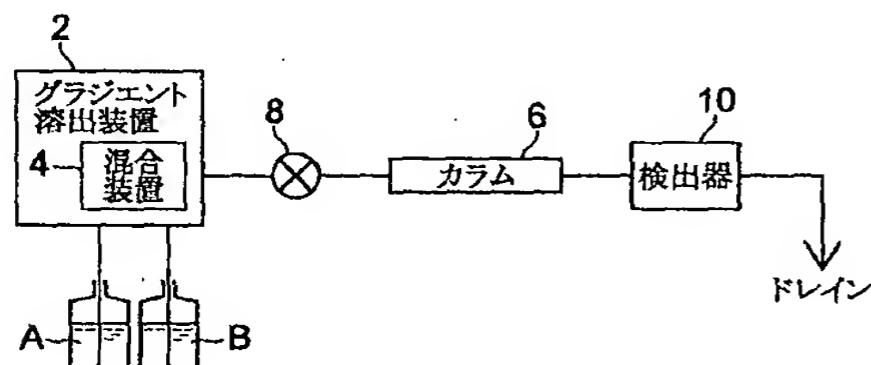
【図3】ジョイント部22a～22cを設けた混合装置の実施例を示す斜視図である。

【図4】混合装置のさらに他の実施例を示す分解斜視図である。

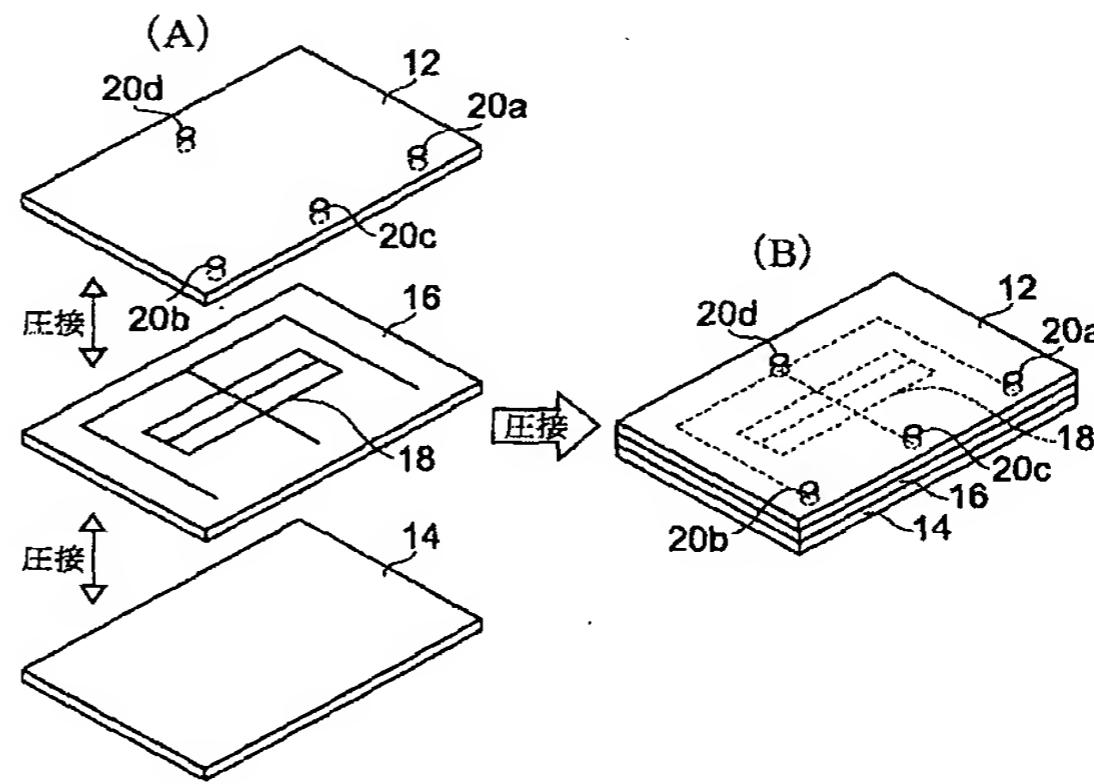
【符号の説明】

2	グラジエント溶出装置	
4	混合装置	
6	カラム	
8	試料導入部	
10	検出器	
12, 14, 32, 34		金属耐食性板
16, 36, 38, 40		金属薄板
18	流路18	
20a～20d, 44, 46a, 46b, 48a, 48b, 52a, 52b		貫通穴
22a～22c		ジョイント部
50	長穴	

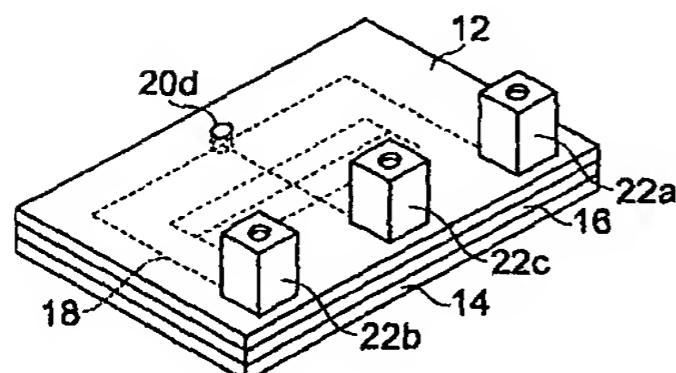
【図1】



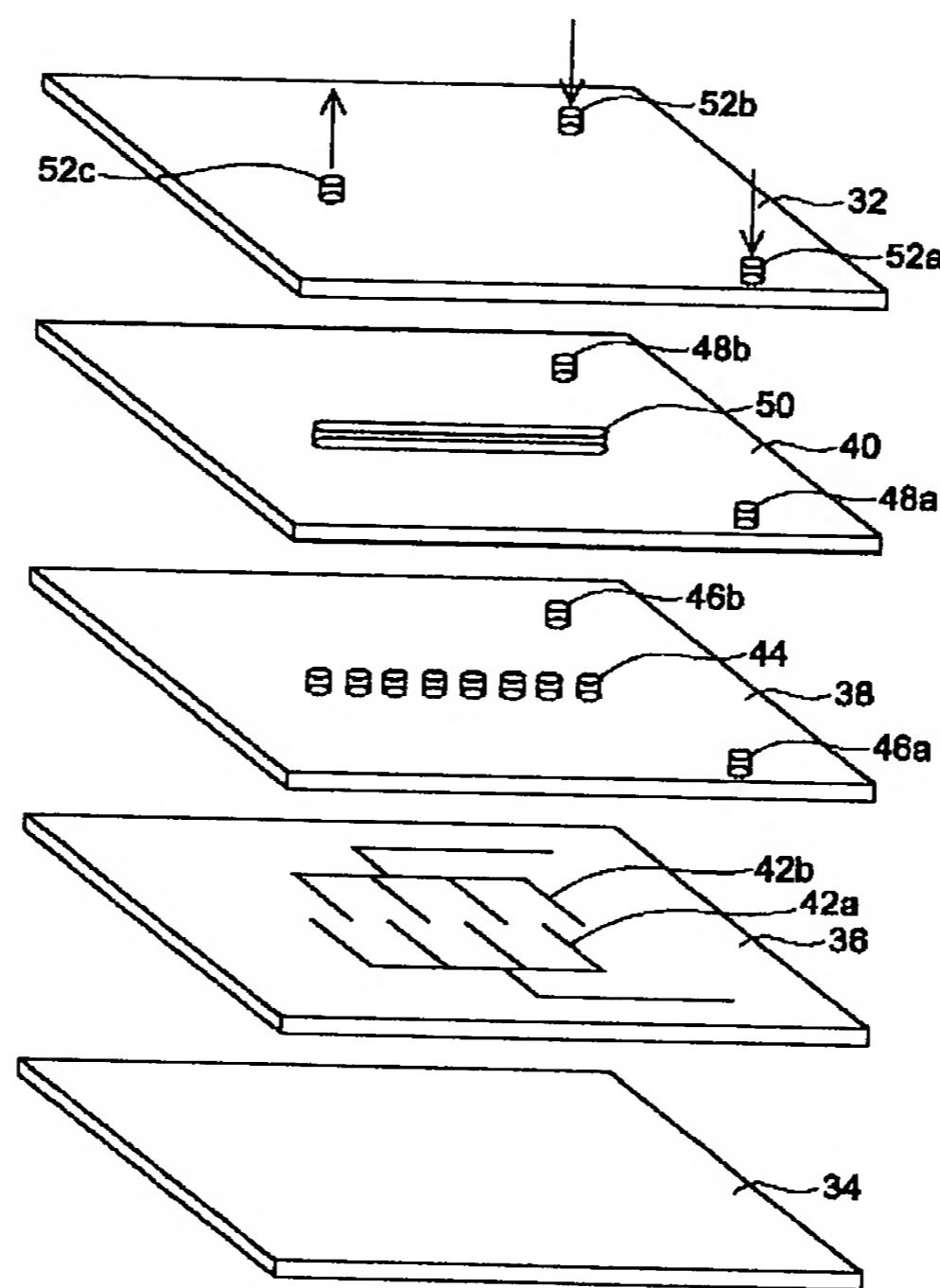
【図2】



【図3】



【図4】



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CLAIMS

[Claim(s)]

[Claim 1] Mixed equipment of the eluate used with the gradient elution equipment of a liquid chromatograph characterized by providing the following. At least two liquid feed hoppers which it is joined so that at least two corrosion-resistant boards may form passage in the interior, and the zygote is constituted, are prepared in the position where the aforementioned passage differs on the superficies of the zygote, and supply each eluate. Output port which takes out the eluate which was prepared in the position where the aforementioned passage differs further, and was mixed.

[Claim 2] It is mixed equipment according to claim 1 which the aforementioned zygote consists of two corrosion-resistant boards, the aforementioned passage is formed in the plane of composition of the aforementioned zygote, and the aforementioned corrosion-resistant board, on the other hand, boils the aforementioned liquid feed hopper and the aforementioned output port, or is formed in both by being divided.

[Claim 3] It is mixed equipment according to claim 1 which the aforementioned zygote is put between the corrosion-resistant boards of two upper and lower sides, the corrosion-resistant sheet metal of at least one sheet is joined, the aforementioned passage is formed with the aforementioned sheet metal put between the interior, and the aforementioned corrosion-resistant board, on the other hand, boils the aforementioned liquid feed hopper and the aforementioned output port, or is formed in both by being divided.

[Claim 4] The passage of the aforementioned sheet metal is mixed equipment according to claim 3 which is one passage connected with branching within the sheet metal of one sheet.

[Claim 5] The passage of the aforementioned sheet metal is mixed equipment according to claim 3 with which it consists of passage formed in the sheet metal of two or more sheets, the passage for each eluates which became independent mutually is formed in the sheet metal of one sheet of them, and the passage for mixture connected with all the passage of the sheet metal of the one aforementioned sheet is formed in other sheet metal.

[Claim 6] The liquid chromatograph which equipped either of the claims 1-5 with the mixed equipment of a publication.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to liquid chromatographs, such as a high-speed liquid chromatograph, and the eluate mixture equipment for gradient analysis (mixer) used there.

[0002]

[Description of the Prior Art] In gradient analysis of a liquid chromatograph, in order to mix two kinds or the eluate beyond it and to lead to a column, the gradient elution equipment is equipped with the mixed equipment which mixes two or more liquid. There are some which many things of a flow through method without moving part are used as mixed equipment, for example, were filled up with balls, such as a stainless steel, into the pipe whose length a bore is about 3mm and is about 50mm. Such mixed equipment consists of two or more machining articles, such as a machining article of the entrance and an outlet.

[0003]

[Problem(s) to be Solved by the Invention] Since such mixed equipment has filled up the interior with the ball for liquid mixture, internal capacity becomes large. The passage for mixture is determined by the ball with which the interior was filled up, and cannot form desired passage. Moreover, processing and an assembly become complicated and also become cost quantity.

[0004] The 1st purpose of this invention is easy also for being able to solve these problems, being able to make inner capacity small, and forming a desired interflow way, and is that an assembly also offers easy mixed equipment. The 2nd purpose of this invention is offering the liquid chromatograph equipped with such mixed equipment.

[0005]

[Means for Solving the Problem] The mixed equipment of this invention is characterized by to have at least two liquid feed hoppers which it is joined so that at least two corrosion-resistant boards may form passage in the interior, and the zygote is constituted, are prepared in the position where the aforementioned passage differs on the external surface of the zygote, and supply each eluate, and output port which takes out the eluate which was prepared in the position where the aforementioned passage differs further, and was mixed. The liquid chromatograph of this invention is equipped with above mixed equipment.

[0006]

[Embodiments of the Invention] One form of a zygote which consists of at least two corrosion-resistant boards consists of two corrosion-resistant boards, passage is formed in the plane of composition of the zygote, and, on the other hand, a corrosion-resistant board boils a liquid feed hopper and the aforementioned output port, or it is divided and prepared in both.

[0007] Other forms of a zygote are put between the corrosion-resistant boards of two upper and lower sides, the corrosion-resistant sheet metal of at least one sheet is joined, passage is formed with the sheet metal put between the interior, and, on the other hand, the aforementioned corrosion-resistant board boils a liquid feed hopper and the aforementioned output port, or it is divided and prepared in both.

[0008] In this case, the passage of sheet metal consists of passage which could also consider as one passage connected with branching within the sheet metal of one sheet, or was formed in the sheet metal of two or more sheets, the passage for each eluates which became independent mutually is formed in the sheet metal of one sheet of them, and the passage for mixture connected with all the passage of the sheet metal of one sheet can be formed in other sheet metal.

[0009] Drawing 1 shows an example of the liquid chromatograph for gradient analysis. It mixes according to a predetermined program and gradient elution equipment 2 supplies two kinds of eluates A and B in a column. You may be which method although there are a high-pressure gradient method and a low voltage gradient method in gradient elution equipment 2. In order that the inside of gradient elution equipment 2 may mix two kinds of

eluates, it has mixed equipment 4 of this invention. 6 is a column which separates a sample and the sample induction 8 is formed in the eluate passagè which results in a column 6. 10 is a detector which detects a sample component from the eluate of a column 6. The eluate which passed through the detector 10 is discharged to a drain. this invention can be similarly applied, when mixing three or more kinds of eluates.

[0010] Drawing 2 shows one example of the mixed equipment of this invention, (A) is the decomposition perspective diagram and (B) is a perspective diagram in the state where it assembled. The up-and-down metal corrosion resistance board 12 and the sheet metal 16 in which passage was formed among 14 are put, and the mixed equipment unified as shown in (B) is constituted by carrying out the pressure welding of these metal plates of three sheets, and joining. Sheet metal 16 is a metal plate with the corrosion resistance to which it is thin from stainless steel (for example, SUS316 etc.) 2mm or less, and is a metal plate of the quality of the material same as the corrosion-resistant boards 12 and 14.

[0011] Passage 18 is formed in sheet metal 16 of etching processing or press working of sheet metal. Passage 18 can also be formed as a penetrated slot depending on the configuration of passage, although it has a closed loop as shown in drawing 2 and a case is formed as a slot with a bottom.

[0012] Passage 18 is the passage connected with one with a tee or a closed loop, and four through holes 20a–20d have opened it in the top corrosion resistance board 12 corresponding to the passage 18. The bottom corrosion resistance board 14 is a flat metal plate without neither a slot nor a hole.

[0013] If these metal plates 12, 14, and 16 of three sheets are joined with junction methods, such as for example, HIP processing, the passage which has an entrance on the top corrosion resistance board 12 as shown in (B) will be formed. HIP (hot isostatic pressing : hot isostatic pressing) processing of the junction method is the method of joining by pressurizing a metal plate by about 1000kg in piles. The junction by HIP processing can attain firm adhesion, and has the advantage which faults, such as a liquid spill, cannot generate easily. However, you may join by other methods.

[0014] In the example of drawing 2, it becomes eluate output port, then mixed equipment of three kinds of eluates about the one remaining holes by using three of four holes 20a–20d as an eluate feed hopper. Moreover, it can also consider as the eluate output port which chose other two either and was mixed by using two of four holes 20a–20d as an eluate feed hopper. The hole which was not chosen is closed. The mixed ratio of an eluate can be chosen by selection of an eluate feed hopper and eluate output port.

[0015] In the example of drawing 2, when formed as a slot in which passage has a bottom, the bottom corrosion resistance board 14 can be omitted and mixed equipment can be constituted as a zygote of the top corrosion resistance board 12 and the sheet metal 16 in which passage was formed. In this case, it is desirable to thicken thickness of a sheet metal 16, when raising a mechanical strength.

[0016] Drawing 3 forms the joint sections 22a–22c in the mixed equipment of the example of drawing 2, in order to make supply and drawing of an eluate easy. In this example, the joint [it / it] sections 22a–22c fix in three holes of the top corrosion resistance board 12, and 20d of other one hole is closed. Two of those joint sections 22a–22c are used as an eluate feed hopper, and other one is used as mixed eluate output port.

[0017] Other examples are shown in drawing 4. In this example, in order to form an interflow way in sheet metal, the sheet metal of three sheets is prepared, and it is inserted among the corrosion-resistant boards 32 and 34 of the upper and lower sides of three sheets, is joined, and is unified.

[0018] Two passage 42a and 42b which became independent mutually is formed in sheet metal 36 of etching or press working of sheet metal. As long as it is the configuration of these slots 42a and 42b, even if a slot has a bottom, you may penetrate it. The point of the slot which each slot 42a and 42b had branched in the shape of a ctenidium, respectively, and branched is arranged by turns.

[0019] The through hole 44 arranged by the single tier is formed in the sheet metal 38 piled up on sheet metal 36, and the through holes 46a and 46b which serve as a liquid feed hopper corresponding to other positions of Slots 42a and 42b, respectively are formed in it so that it may correspond to the position of Slots 42a and 42b.

[0020] Furthermore, through holes 48a and 48b are formed in the slot 50 penetrated for summarizing a through hole 44 to the sheet metal 40 arranged on sheet metal 38 in one hole, Holes 46a and 46b, and the corresponding position, respectively.

[0021] The through holes 52a and 52b used as a liquid feed hopper are formed in the position corresponding to the through holes 48a and 48b of sheet metal 40 at the top corrosion resistance board 32, and through-hole 52c which becomes liquid output port at the position of a slot 50 is formed.

[0022] The sheet metal 36, 38, and 40 of three sheets put between the interior is a metal plate with corrosion resistance like a stainless-steel board with a thickness of 2mm or less, and is metal plates of the quality of the material same as the corrosion-resistant boards 32 and 34. It was joined by methods, such as HIP processing, and these metal plates 32, 34, 36, 38, and 40 of five sheets were unified. It is desirable to fix the joint section like drawing 3 in Holes 20a, 20b, and 20c.

[0023] In the example of drawing 4, the eluate supplied from Holes 20a and 20b, respectively shunts, respectively by the passage 42a and 42b where sheet metal 36 branched, and is led to the slot 50 of sheet metal 40 through the through hole 44 of sheet metal 38. In the slot 50, according to branching of Passage 42a and 42b, the eluate was drawn by turns, and, as for the eluate taken out from output port 20c, two eluates were mixed.

[0024] Especially the number of sheets of the sheet metal put between up-and-down corrosion-resistant boards is not limited, and can be suitably set up according to the interflow way to form. It does not pass over that the configuration of passage was indicated to be to the example to mere instantiation, but in order to acquire the desired mixed state, it can be designed suitably.

[0025]

[Effect of the Invention] In this invention, since the passage formed in the corrosion-resistant board constitutes an interflow way, forming in a desired configuration can also be easy to form complicated passage, and it can adjust the mixed state, such as a desired mixed ratio. Moreover, if passage is formed by the narrow slot, capacity in mixed equipment can be made small, and it becomes convenient to the analysis which supplies a small amount of eluate. It can also consider as small mixed equipment. Moreover, since it only unifies, corrosion-resistant board junction is carried out, and processing and an assembly are easy, and there are also few part mark and they end.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to liquid chromatographs, such as a high-speed liquid chromatograph, and the eluate mixture equipment for gradient analysis (mixer) used there.

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PRIOR ART

[Description of the Prior Art] In gradient analysis of a liquid chromatograph, in order to mix two kinds or the eluate beyond it and to lead to a column, the gradient elution equipment is equipped with the mixed equipment which mixes two or more liquid. There are some which many things of a flow through method without moving part are used as mixed equipment, for example, were filled up with balls, such as a stainless steel, into the pipe whose length a bore is about 3mm and is about 50mm. Such mixed equipment consists of two or more machining articles, such as a machining article of the entrance and an outlet.

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EFFECT OF THE INVENTION

[Effect of the Invention] In this invention, since the passage formed in the corrosion-resistant board constitutes an interflow way, forming in a desired configuration can also be easy to form complicated passage, and it can adjust the mixed state, such as a desired mixed ratio. Moreover, if passage is formed by the narrow slot, capacity in mixed equipment can be made small, and it becomes convenient to the analysis which supplies a small amount of eluate. It can also consider as small mixed equipment. Moreover, since it only unifies, corrosion-resistant board junction is carried out, and processing and an assembly are easy, and there are also few part mark and they end.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since such mixed equipment has filled up the interior with the ball for liquid mixture, internal capacity becomes large. The passage for mixture is determined by the ball with which the interior was filled up, and cannot form desired passage. Moreover, processing and an assembly become complicated and also become cost quantity.

[0004] The 1st purpose of this invention is easy also for being able to solve these problems, being able to make inner capacity small, and forming a desired interflow way, and is that an assembly also offers easy mixed equipment. The 2nd purpose of this invention is offering the liquid chromatograph equipped with such mixed equipment.

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MEANS

[Means for Solving the Problem] The mixed equipment of this invention is characterized by to have at least two liquid feed hoppers which it is joined so that at least two corrosion-resistant boards may form passage in the interior, and the zygote is constituted, are prepared in the position where the aforementioned passage differs on the superficies of the zygote, and supply each eluate, and output port which takes out the eluate which was prepared in the position where the aforementioned passage differs further, and was mixed. The liquid chromatograph of this invention is equipped with above mixed equipment.

[0006]

[Embodiments of the Invention] One gestalt of a zygote which consists of at least two corrosion-resistant boards consists of two corrosion-resistant boards, passage is formed in the plane of composition of the zygote, and, on the other hand, a corrosion-resistant board boils a liquid feed hopper and the aforementioned output port, or it is divided and prepared in both.

[0007] Other gestalten of a zygote are put between the corrosion-resistant boards of two upper and lower sides, the corrosion-resistant sheet metal of at least one sheet is joined, passage is formed with the sheet metal put between the interior, and, on the other hand, the aforementioned corrosion-resistant board boils a liquid feed hopper and the aforementioned output port, or it is divided and prepared in both.

[0008] In this case, the passage of sheet metal consists of passage which could also consider as one passage connected with branching within the sheet metal of one sheet, or was formed in the sheet metal of two or more sheets, the passage for each eluates which became independent mutually is formed in the sheet metal of one sheet of them, and the passage for mixture connected with all the passage of the sheet metal of one sheet can be formed in other sheet metal.

[0009] Drawing 1 shows an example of the liquid chromatograph for gradient analysis. It mixes according to a predetermined program and gradient elution equipment 2 supplies two kinds of eluates A and B in a column. You may be which method although there are a high-pressure gradient method and a low voltage gradient method in gradient elution equipment 2. In order that the inside of gradient elution equipment 2 may mix two kinds of eluates, it has mixed equipment 4 of this invention. 6 is a column which separates a sample and the sample induction 8 is formed in the eluate passage which results in a column 6. 10 is a detector which detects a sample component from the eluate of a column 6. The eluate which passed through the detector 10 is discharged to a drain. this invention can be similarly applied, when mixing three or more kinds of eluates.

[0010] Drawing 2 shows one example of the mixed equipment of this invention, (A) is the decomposition perspective diagram and (B) is a perspective diagram in the state where it assembled. The up-and-down metal corrosion resistance board 12 and the sheet metal 16 in which passage was formed among 14 are put, and the mixed equipment unified as shown in (B) is constituted by carrying out the pressure welding of these metal plates of three sheets, and joining. Sheet metal 16 is a metal plate with the corrosion resistance to which it is thin from stainless steel (for example, SUS316 etc.) 2mm or less, and is a metal plate of the quality of the material same as the corrosion-resistant boards 12 and 14.

[0011] Passage 18 is formed in sheet metal 16 of etching processing or press working of sheet metal. Passage 18 can also be formed as a penetrated slot depending on the configuration of passage, although it has a closed loop as shown in drawing 2 and a case is formed as a slot with a bottom.

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[0013] If these metal plates 12, 14, and 16 of three sheets are joined with junction methods, such as for example, HIP processing, the passage which has an entrance on the top corrosion resistance board 12 as shown in (B) will be formed. HIP (hot isostatic pressing : hot isostatic pressing) processing of the junction method is the method of joining by pressurizing a metal plate by about 1000kg in piles. The junction by HIP processing can

attain firm adhesion, and has the advantage which faults, such as a liquid spill, cannot generate easily. However, you may join by other methods.

[0014] In the example of drawing 2, it becomes eluate output port, then mixed equipment of three kinds of eluates about the one remaining holes by using three of four holes 20a-20d as an eluate feed hopper. Moreover, it can also consider as the eluate output port which chose other two either and was mixed by using two of four holes 20a-20d as an eluate feed hopper. The hole which was not chosen is closed. The mixed ratio of an eluate can be chosen by selection of an eluate feed hopper and eluate output port.

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[0016] Drawing 3 forms the joint sections 22a-22c in the mixed equipment of the example of drawing 2, in order to make supply and drawing of an eluate easy. In this example, the joint [it / it] sections 22a-22c fix in three holes of the top corrosion resistance board 12, and 20d of other one hole is closed. Two of those joint sections 22a-22c are used as an eluate feed hopper, and other one is used as mixed eluate output port.

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[0019] The through hole 44 arranged by the single tier is formed in the sheet metal 38 piled up on sheet metal 36, and the through holes 46a and 46b which serve as a liquid feed hopper corresponding to other positions of Slots 42a and 42b, respectively are formed in it so that it may correspond to the position of Slots 42a and 42b.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline passage view showing an example of the liquid chromatograph for gradient analysis of this invention.

[Drawing 2] One example of the mixed equipment of this invention is shown, (A) is the decomposition perspective diagram and (B) is a perspective diagram in the state where it assembled.

[Drawing 3] It is the perspective diagram showing the example of the mixed equipment which formed the joint sections 22a-22c.

[Drawing 4] It is the decomposition perspective diagram showing the example of further others of mixed equipment.

[Description of Notations]

2 Gradient Elution Equipment

4 Mixed Equipment

6 Column

8 Sample Induction

10 Detector

12, 14, 32, 34 Metal corrosion resistance board

16, 36, 38, 40 Sheet metal

18 Passage 18

20a-20d, 44, 46a, 46b, 48a, 48b and 52a, 52b through hole

22a-22c Joint section

50 Slot

[Translation done.]

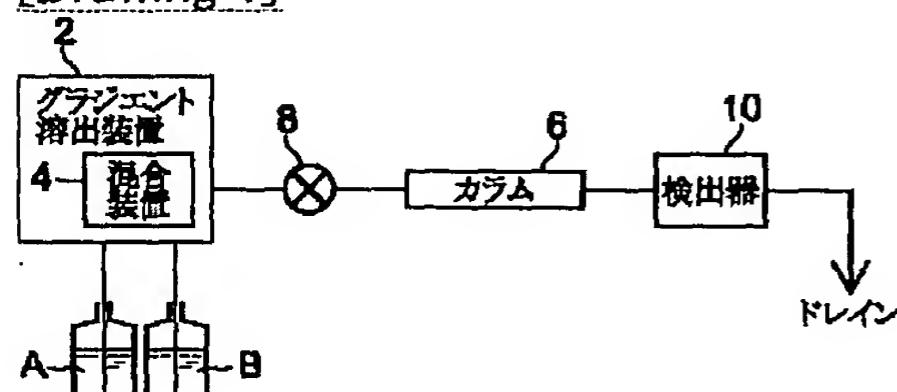
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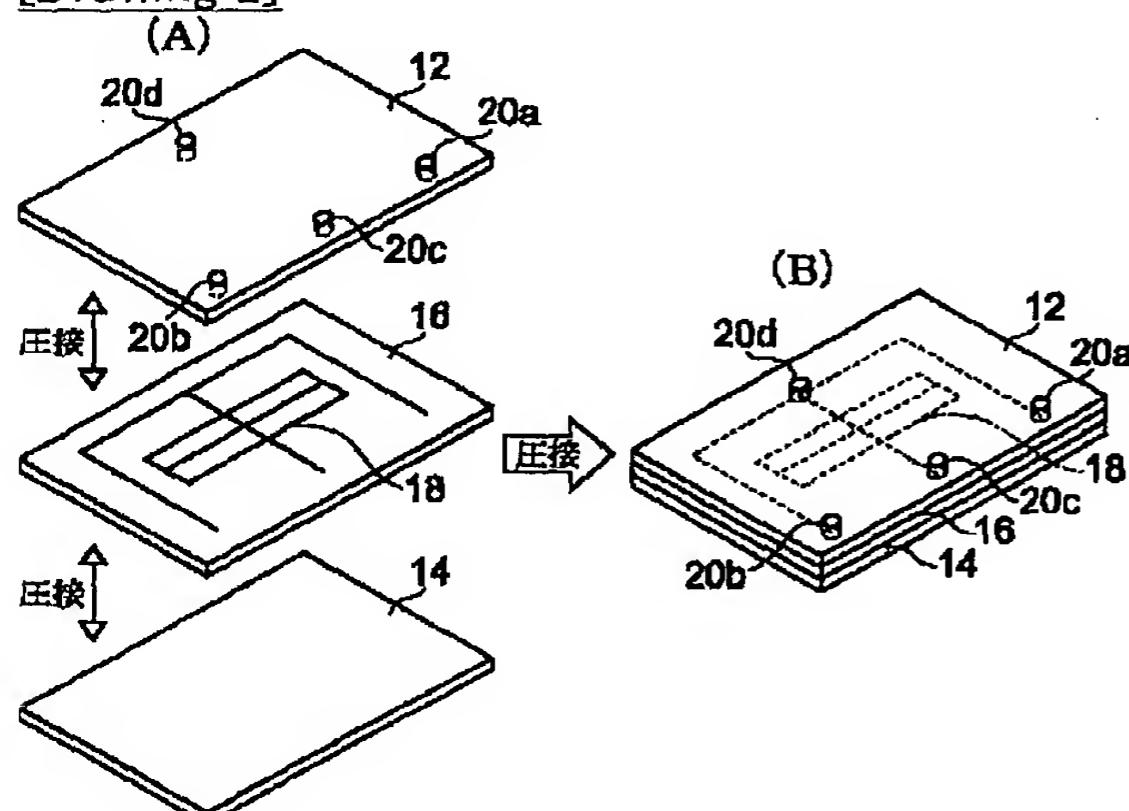
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DRAWINGS

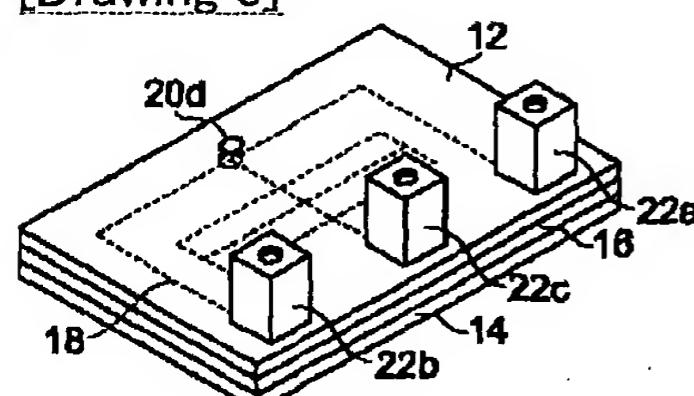
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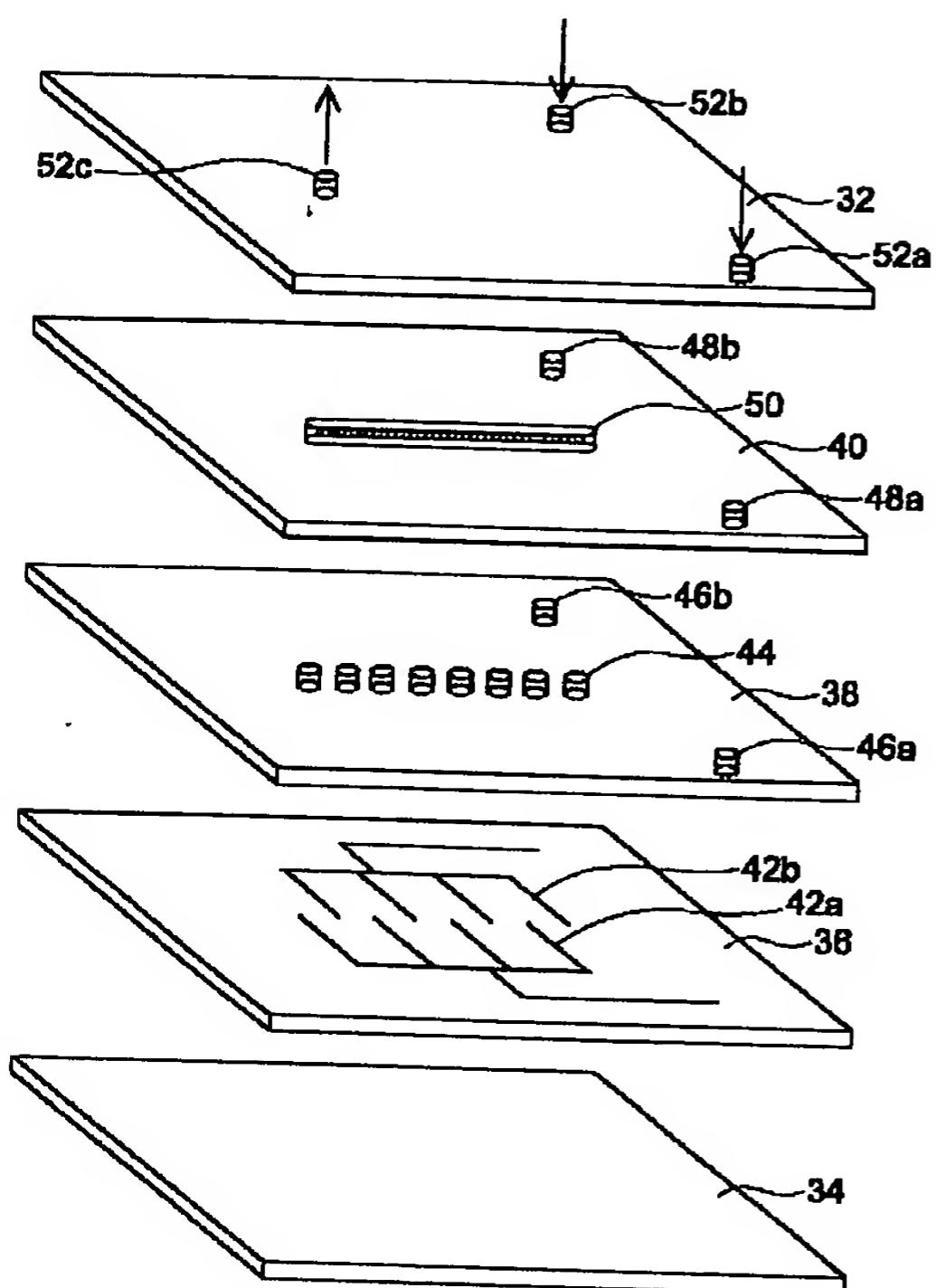
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]